

of Photography," by Capt. Abney, F.R.S.; May 13, "On some Physical Applications of Light," by Prof. W. G. Adams, F.R.S.

THE *Thunderer* gun experiments were continued at Woolwich last Friday, the object on that day being to test what is known as the "wedging" theory—the supposition that the tilting or displacement of the wad had to do with the bursting of the original gun. The experiments on Friday tended clearly to disprove this theory.

THE Public Works Department at Yedo have just published the *Reports of Progress* for 1878 and 1879 of the Geological Survey of Japan under Mr. B. S. Lyman.

THE Indian papers state that experiments are about to be made in Cyprus to test the possibility of cultivating mango seeds, as well as the seeds of other Indian fruits and vegetables.

EARTHQUAKES are reported (1) from Weisskirchen, where on December 22 at 5 A.M. a violent shock was felt; (2) from St. Blasien, in the Black Forest, where a shock was noticed on the same day at 10 P.M.; (3) from Idria (Carniola), where a subterranean explosion took place at 8.30 P.M., combined with a violent shaking of the ground and a cannon-like report. Several shocks were felt at Churwalden (Switzerland, canton of Chur) on January 7, between 2 and 4 A.M.; the last shock was accompanied with a noise like that of thunder, so that people were awake and dogs howled. In the Domochleg and at Savagnino only two shocks were felt, at 3h. 45m. and at 4h. 30m. The shocks had the direction from north to south.

AT Freiburg, in Breisgau, the beautiful and rare phenomenon of the *fata morgana* was observed at noon on December 16. While the sun was shining the fine pyramid of the Cathedral tower showed itself reflected above, of course with the point downwards. The reflecting stratum of air was almost at the level of the summit of the tower, thus producing a most peculiar effect.

WE are glad to see that the Epping Forest Field Club has been successfully formed, under the presidency of Mr. R. Meldola. From the tone which prevailed at the meeting of January 10, we should think the Club is likely to do good work. The original list of members is a pretty large one, and contains several well-known names.

THE continuation of frosty weather has produced unprecedented effects on the Lower Loire round Saumur. The bed of the river having an extent of about 1,000 yards, and the depth of water being very shallow, the Loire was entirely frozen and the flow of water towards the sea was almost entirely stopped. The consequence was that the level of the water was raised, and the walls protecting the low lands in danger of being submerged. It was necessary to employ dynamite to open a channel for the water. Unfortunately a part of the stream has found its way into the low lands. New ice is coming from the high lands, and the military have been ordered to work under the orders of civilian engineers.

AN ascent of Mount Hekla was made last summer by a lady, Miss Th. Petursson, daughter of the Bishop of Reykjavik, for the purpose of geological investigations. According to her observations the temperature at the bottom of the larger craters has of late risen considerably, while dense white columns of steam were rising from crevasses and holes which were hardly visible. The sulphurous odour of this steam was stronger than usual. The observations seem to indicate an approaching eruption of the volcano.

AN interesting archæological discovery has been made near Lehmke (in the district of Oldenstadt) consisting of some 1,200

mediæval metal plates, so-called *bractes*. Most of them bear the stamp of a lion in varying positions, others that of a figure with sword and standard, and a horizontal key below. The objects in question are now in the possession of the "Kreis-hauptmann" of Oldenstadt.

THE German Postmaster General, Herr Stephan, and Dr. Siemens, have succeeded in constituting an electro-technical society, which has for its objects the furtherance and development of the technical application of electricity, the progress of the knowledge of electricity by means of its technical appliances, and the establishment of a place of meeting for German technical electricians, whose scientific and commercial interests will, of course, be greatly benefited by such mutual intercourse.

THE additions to the Zoological Society's Gardens during the past week include a Rhesus Monkey (*Macacus erythreus*) from India, presented by Mr. F. C. Grosvenor; two Bankiva Jungle Fowls (*Gallus bankiva*), two Starred Tortoises (*Testudo stellata*) from India, presented by Mr. W. Dunn, C.E., C.M.Z.S.; a Bar-tailed Godwit (*Limosa lapponica*), a Grey Plover (*Squatarola helvetica*), six Knots (*Tringa canutus*), thirteen Dunlins (*Tringa cinclus*), European, presented by Mr. F. Cresswell; three Chinchillas (*Chinchilla lanigera*) from South America, a Grey Struthidea (*Struthidea cinerea*) from Australia, a Red-throated Amazon (*Chrysotis collaria*) from Jamaica, purchased; two Fulmar Petrels (*Procellaria glacialis*), North European, deposited.

OUR ASTRONOMICAL COLUMN

THE ORION-TRAPEZIUM.—The following letter has been addressed to us by Prof. Holden, of the Naval Observatory, Washington:—

"IN NATURE, vol. xxi. p. 117, there is a note on a seventh star in the Orion-trapezium, which is 636 of G. P. Bond's Catalogue. It is there rated as mag. 13.3. Two other stars, 612 and 618 of Bond's catalogue are as near one of the larger stars as 636 is, and if it is intended to extend the nomenclature of seventh star, eighth star, &c., to these stars (which seems inadvisable), they should be included. Their positions from θ^1 Orionis are:—

Mag.	$\Delta \alpha$ (1857.0)				$\Delta \delta$ (1857.0)			
612	13.5	...	...	...	- 16.4	...	...	+ 24.6
618	13.1	...	...	...	- 10.4	...	...	+ 24.6

The magnitudes are too faint for Argelander's scale extended, but serve to compare with that of 636 viz. 13.3.

"As tests for large telescopes, quite a number of small stars discovered by Bond may be mentioned, whose positions are given in *Annals* of the Harvard College Observatory, vol. v. All of these really exist, as they have been repeatedly seen with the 26-inch refractor of this Observatory. They are Nos. 595 (13.9m.), 601 (15.6), 608 (14.3), 621 (15.6), 625 (15.6), 631 (14.3), 666 (13.9), 677 (14.8), 676 (13.1), 642 (15.6), 675 (15.2). The faintness of these stars (which are much better seen with a low power than with a high one) speaks well for the diligence of the late George Bond, whose search in this region was very thorough. Other small stars exist in the neighbourhood as follows:—

- "1. Rosse, No. 56, near G.P.B. No. 581.
- "2. A star, s.p., G.P.B. No. 724.
- "3. A double-star, n.f., G.P.B. No. 685.
- "(2 and 3 were discovered by Lassell.)
- "4. Three stars in or near the region bounded by the lines 641 to 663, 663 to 652, 652 to 641.
- "5. A star or mass of nebula which is not yet three years of age, has developed itself in the middle of the dark channel half way between 669 and 642. The star (?) itself is, roughly, equally distant from 669, 641, and 642.
- "There are no stars within the trapezium.
- "Cooper reports a star following G.P.B. 516 a few seconds. I cannot find it.
- "Any observations on these stars or on the celebrated variable 654 (frequently observed here) will be gladly received by me,

and I shall be happy to have such for insertion in a paper now nearly ready on the Huyghenian region of this nebula."

For the convenience of such observers as may not have ready access to the "Annals of the Astronomical Observatory of Harvard College, vol. v.," which contains G. P. Bond's elaborate memoir on the nebula of Orion, the following differential positions of the stars mentioned by Prof. Holden, with reference to θ^1 Orionis, are extracted:—

Diff. R.A.	Diff. Decl.	Diff. R.A.	Diff. Decl.
No. 516 ... - 276°0 ... - 29°5		No. 652 ... + 30°2 ... + 17°6	
581 ... - 76°1 ... - 159°1		654 ... 33°2 ... + 10°0	
595 ... - 46°9 ... - 15°0		663 ... 55°5 ... + 147°1	
601 ... - 36°0 ... - 31°0		666 ... 59°7 ... - 195°8	
608 ... - 23°7 ... - 18°0		669 ... 63°3 ... + 100°0	
621 ... - 8°0 ... - 36°0		675 ... 74°5 ... - 93°4	
625 ... - 4 ... - 28		676 ... 78°5 ... - 27°6	
631 ... + 3 ... - 42		677 ... 78°6 ... - 201°4	
641 ... + 11°9 ... + 111°2		685 ... 97°7 ... - 95°0	
642 ... + 13 ... + 48		724 ... + 183°3 ... - 176°0	

It will be remarked that Prof. Holden states there are actually no stars within the trapezium. Mr. Burnham's experience with the 18½-inch refractor at Chicago is to the same effect; in the notes to his last catalogue of double stars, he writes: "Several observers have seen, or believe they have seen, other minute stars in the trapezium, most of them using comparatively small apertures. While making the measures given above, and at other times, under very favourable conditions, the interior of the trapezium and the vicinity of the principal stars were carefully examined. There was not the slightest suspicion of any additional stars. If the sixth star itself had been double, with a distance of 1"·0, it could not have been overlooked. I have very little faith in the real existence of these suspected stars after the failure of this and other large refractors to show them." And he considers it is wholly improbable that they should all be variable in such manner as to render them at all times invisible during the last few years. Telescopes were not so perfect forty years since as they are now, and we might be perhaps justified in attributing to optical illusion the supposed existence of the three stars within the trapezium, recorded by De Vico in 1839, and the star, near the "fifth," detected by Struve, which Gruithuisen claimed to have discovered about the same time, and which he says Schwabe had also seen with a 6-foot Fraunhofer. But what are we to say to the observations of Dr. Huggins, as detailed in vol. xxvi. of the *Monthly Notices* of the Royal Astronomical Society? They appear to point to something more than optical illusion, and notwithstanding the negative testimony as to the actual existence of stars within the trapezium, to render it desirable that a protracted examination of this region should be instituted with telescopes of suitable capacity. One of Dr. Huggins's stars is not far from the position of a star in De Vico's diagram (see *Memoria intorno a parecchie Osservazioni . . . in Collegio Romano, l'Anno 1839*, plate I., and Gruithuisen's *Astronomisches Jahrbuch*, 1841, p. 143).

THE TOTAL SOLAR ECLIPSE OF JANUARY 11.—A Reuter's telegram brings intelligence of the successful observation of the total phase in this eclipse on the Santa Lucia mountain, California, with the important addition that an intra-Mercurial planet has been again seen. In the longitude of this mountain the duration of totality upon the central line, employing the elements of the *Nautical Almanac*, would be only 38 seconds, with the sun at an altitude of 12°; if the semi-diameters adopted for eclipses in the American ephemeris are used, the duration would be even less—hardly 27 seconds. Under such circumstances it must have required very minute and skilful preparation and considerable smartness of execution to insure the results announced.

GEOLOGICAL NOTES

THE MSS. of Sartorius von Waltershausen, descriptive of Etna, have been placed, we understand, in the hands of Prof. von Lasaulx, of Breslau, with a view to publication. They will complete the colossal pile which the veteran geologist erected to the glory of his favourite mountain.

ANOTHER distinguished and venerable vulcanologist, Dr. Abich has gone to Vienna to prepare his petrographical descriptions of the Caucasian region, in which he has been so long at work. The facilities for the most delicate analyses of rocks and

minerals at Vienna have likewise attracted thither M. Renard, of Brussels, who has been entrusted with the chemical and microscopic investigation of the abyssal deposits brought by the *Challenger* from its great ocean survey. M. Renard is at present in this country arranging with the *Challenger* Commission as to the prosecution and publication of his labours. His beautifully drawn plates which illustrate the more remarkable facts brought to light by the *Challenger* dredgings, are being exquisitely reproduced by chromolithography in Vienna.

IN a recent number of the *Bulletin* of the United States Geological and Geographical Survey of the Territories (a publication still continued for a while, though the Survey itself has ceased to exist), Dr. F. V. Hayden describes the Two Ocean Pass which has for some years been known to separate the head waters of the Yellowstone from those of the Snake River. He confirms and extends previous accounts of this interesting locality, showing that it is a flat meadow-like depression cut by erosion on the watershed. During wet weather this marshy ground becomes a lake which drains both ways, one branch finding its way into the Pacific, and the other into the Atlantic, by one of the longest routes for running water on the surface of the planet.

PROF. MARSH continues his descriptions of the fossil treasures continually arriving to increase the already ample stores at Yale College. He remarks that while the Mosasauroid reptiles are so rare in Europe that the type-specimen described by Cuvier still remains the most perfect yet discovered here, and the only one from which important characters have been made out, in North America the group attained a marvellous development, and was represented by several families with numerous genera and species, of which the relics of not less than 1,400 distinct individuals are contained in the museum at Yale.

DR. MICHEL MOURLON of Brussels has in preparation a work on the geology of Belgium. It will form an octavo volume of at least 500 pages, containing full descriptions of the different geological formations, with unpublished plates of the microscopic structure of rocks, copious lists of fossils, and an account of the industrial resources of each formation, and will be followed by a complete bibliography of the geology, palaeontology, and lithology of Belgium. The re-issue of Dumont's beautiful and most trustworthy geological map of Belgium naturally suggests the desirability of some general guide to the public in perusing the map or travelling through the country, for the admirable *prodrome* of M. Dewalque can hardly now be procured. Dr. Mourlon's position as one of the Conservateurs of the Royal Museum of Natural History, and his experience as a field geologist both before and since his connection with the Geological Survey of Belgium, give him exceptional advantages for the preparation of such a work, which will no doubt be as duly appreciated by his fellow-countrymen as it will be welcomed by students of geology abroad.

PHYSICAL NOTES

OBSERVATIONS of phosphorescence phenomena in high vacua of the nature described by Crookes and Maskelyne have been lately made on a variety of substances by Herr Stürtz of Bonn, in company with Herr Müller (*Wied. Ann.* No. 11). The following substances gave phosphorescence (those marked with an asterisk were made red hot before being brought into the tube; in the ordinary state they showed little or no phosphorescence):—Brucite,* magnesite,* phosphate of magnesia, pitch-blende, wolframite, cerusite, adularia, orthoclase,* kaolin,* axinite,* silicate of zinc,* zinc-spar,* double spar, apatite, franklinite, azure spar, fergusonite,* apophyllite,* dolomite, celestine,* red spinelle, cobalt-glauc, stannite, baryta, chromate of iron, lazulite, lepidolite, zinnwaldite, ankerite, greenockite, pectolith, borax, cinnabar, leucite, sanidin, and Java meteoric stone of 1869. A few luminous points were observed in crystals of arsenical iron and antimonite. Pieces of a phosphorescent substance made red hot are luminous with a different colour from that of pieces of the same not made red hot. In cerusite the phosphorescence is lost through heating. The authors give a list of substances which do not phosphoresce.

A SYSTEM of electrical storing, considered to be free from the disadvantages of other systems, is described by Professors Houston and Thomson in the Franklin Institute *Journal* for December, 1879. They use a saturated solution of zinc sulphate in a suitable vessel, having at the bottom a plate of copper, to